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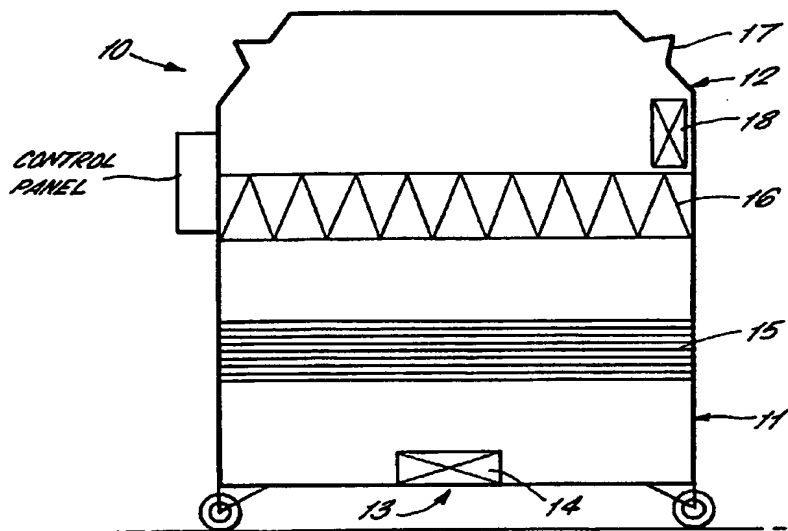
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[Continued on next page]

(54) Title: APPARATUS FOR REMOVING STERILANT FROM A STERILANT CONTAINING ATMOSPHERE



(57) Abstract: The disclosure relates to an apparatus for removing a sterilant from a sterilant containing atmosphere of a room comprising an enclosure (10) having an inlet (13) to receive sterilant containing air from the room following sterilization of the room, outlet nozzles (17) to return air from which sterilant has been removed to atmosphere and a catalyst (15) within the enclosure for removing sterilant from the air. A fan (14) draws sterilant containing air from the inlet through the catalyst and thence to atmosphere. An additional fan (18) is provided to circulate air containing sterilant from the room during a room sterilization process through that part of the enclosure which is downstream of the catalyst to ensure sterility of that part of the enclosure for the sterilant removal phase.



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FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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APPARATUS FOR REMOVING STERILANT FROM A STERILANT CONTAINING
ATMOSPHERE

5 This invention relates to an apparatus for removing a sterilant from a sterilant containing atmosphere in a room or other enclosure. A method of removing hydrogen peroxide gas from a room following gaseous surface sterilisation.

10 It is frequently necessary to sterilise the surfaces inside clean rooms in which pharmaceutical manufacturing processes are operated. Similar sterilising is also required in the biotechnology, biomedical and health care industries.

The traditional technique used for the sterilisation process has been to generate formalin vapour and allow this to remain in the room for a period of time and then using an air extraction system to remove the formalin by dilution until it is safe to re-enter the room.
15 This technique although effective in reducing the bio-burden has the disadvantage that it leaves a residue of para-formaldehyde which is persistent and causes an unpleasant smell.

More recently it has been possible to use gaseous hydrogen peroxide as the sterilising agent. This has the advantage of breaking down to water and oxygen, and therefore does
20 not leave a residue. When properly applied it is also a much faster process than fumigation with formalin but there is still the problem of removing the residual gas once sterilisation has been achieved.

With hydrogen peroxide it is generally true that the largest phase of a sterilisation cycle
25 will be the time for aeration to remove the residual gas to a safe level. Frequently it is possible to use the room ventilation system to extract the air and residual hydrogen peroxide gas, but in some buildings this may not be possible. If for example there is a common extract system, with some percentage of re-circulation then the extracted air containing the hydrogen peroxide may be circulated back to other areas and under such
30 circumstances it is desirable to have an alternative aeration technique.

As a good general rule it may be assumed that by doubling the air extraction rate after hydrogen peroxide sterilisation it is possible to halve the time required to remove the active gas.

- 5 Most of the commercially available hydrogen peroxide gas generators circulate the gas through the room to be sterilised and then back to the generator. The air that is returned to the generator is then processed and further amounts of hydrogen peroxide gas are added. At the end of a gassing phase of a sterilisation cycle the air continues to circulate through the gas generator but the returning hydrogen peroxide is decomposed in the
- 10 generator to water and oxygen. This circulating process breaking down the hydrogen peroxide would eventually remove all of the active gas from the room, but as this circulating flow is small the time taken to reduce the gas concentration would be very long.
- 15 This invention provides an apparatus for removing a sterilant from a sterilant containing atmosphere of a room comprising an enclosure having an inlet to receive sterilant containing air from the room following sterilization of the room, an outlet to return air from which sterilant has been removed to atmosphere, a catalyst within the enclosure for removing sterilant from the air, means for drawing sterilant containing air from the inlet
- 20 through the catalyst and thence to atmosphere and means to circulate air containing sterilant from the room during a room sterilization process through that part of the enclosure which is downstream of the catalyst to ensure sterility of that part of the enclosure for the sterilant removal phase.
- 25 Preferably a filter is located in the enclosure between the inlet and outlet to filter air passing therethrough.
- More specifically the filter may be located downstream of the catalyst and to be sterilized by supplemental means for drawing sterilant through the enclosure downstream of the
- 30 catalyst during the room sterilization process.

In any of the above arrangements the catalyst may be a carbon filter.

Also in any of the above arrangements the outlet may comprise a nozzle or nozzles for directing the stream of air from which sterilant has been removed into the atmosphere
5 around the enclosure to create turbulence in the air.

The supplemental means to draw sterilant through the part of the enclosure downstream of the catalyst during the room sterilization process may comprise further fan means of relatively low throughput compared with the first mentioned fan means, the further fan
10 means having a further inlet disposed in said enclosure on said downstream side of the catalyst to draw air containing sterilant from the atmosphere into the enclosure during the room sterilization process and to circulate air through the downstream side of the enclosure to sterilize that part of the enclosure, the air containing sterilant being released from the enclosure by said outlet from the enclosure.

15 The apparatus may be mounted on wheels to be readily mobile.

The present invention provides a rapid method of removing the active gas from the room without the necessity of providing an additional extract system.

20 The following is a description of some specific embodiments of the invention, reference being made to the accompanying drawings in which:

Figures 1 and 2 are diagrammatic views of mobile apparatus for removing sterilant from the air.

25 The apparatus consists of a mobile container 10 having a lower casing 11 and a removable top cover 12. The lower case has an air inlet 13 in the bottom wall of the casing, a high capacity fan mounted in the casing directly above the inlet and a carbon catalyst 15 extending across the full width and length of the casing above the fan. An HEPA filter 16
30 extends across the casing above the catalyst.

The fan 14 draws air from the room and drives it through the catalyst or activated carbon filter 15. A suitable catalyst would be Ruthenium and the activated carbon is a special grade, which will decompose hydrogen peroxide. Any hydrogen peroxide gas passing through the catalyst or carbon filter will be decomposed to water and oxygen. On leaving the catalyst or carbon filter 15 the air passes through a HEPA Filter 16 to remove any particulate matter ensuring that the air being returned to the clean room matches the specification required within the room.

The air leaves the apparatus through one of a series of adjustable nozzles, 17 placed around the top cover 12.

The nozzles produce jets of high speed air to ensure good mixing of the air within the room ensuring that there are no pockets of residual gas.

On the side of the apparatus is a control panel which may be detached and placed remotely so that the equipment may be operated from outside of the area to be sterilised either manually or by a connection to the gas generator which will activate the device when it is required to aerate the room.

During the sterilising phase of the room a small fan 18 positioned in the casing lid 12 operates drawing the room air containing sterilisation gas into the top cover through an inlet (not shown). This ensures that the surfaces downstream of the filter 16 inside the device are sterile and hence will not cause contamination to the room after sterilisation.

The problem with any aeration system placed within a room is to ensure that it cannot cause contamination of the room in which it is placed. Within the aeration unit the space above the HEPA (Particulate Air Filter) 16 will be non-sterile, because it will have been exposed to non-sterile air.

This problem is overcome as indicated above by drawing some of the sterilising gas, during the gassing process, into this space and hence causing decontamination. If this

space is not decontaminated then, when the aeration unit is used to remove the sterilising gas from the room, there is a danger of passing any contamination from this enclosed space in the aeration unit out into the decontaminated room.

- 5 An alternative arrangement of the apparatus is shown in Fig 2, which functions in precisely the same way. The difference in the embodiment of Fig 2 is that both the catalyst and carbon filter 15 and the HEPA Filter 16 are circular and not of rectangular construction. The circular construction has the advantage that a larger filter face area is possible in the same size footprint.

CLAIMS:

1. An apparatus for removing a sterilant from a sterilant containing atmosphere of a
5 room comprising an enclosure having an inlet to receive sterilant containing air from the
room following sterilization of the room, an outlet to return air from which sterilant has
been removed to atmosphere, a catalyst within the enclosure for removing sterilant from
the air, means for drawing sterilant containing air from the inlet through the catalyst and
thence to atmosphere and means to circulate air containing sterilant from the room during
10 a room sterilization process through that part of the enclosure which is downstream of the
catalyst to ensure sterility of that part of the enclosure for the sterilant removal phase.
2. An apparatus as claimed in claim 1, wherein a filter is located in the enclosure
between the inlet and outlet to filter air passing therethrough.
15
3. An apparatus as claimed in claim 2, wherein the filter is located downstream of
the catalyst and is sterilized by supplemental means for drawing sterilant through the
enclosure downstream of the catalyst during the room sterilization process.
- 20 4. An apparatus as claimed in any of the proceeding claims, wherein the catalyst is a
carbon filter.
5. An apparatus as claimed in any of the proceeding claims, wherein the outlet
comprising a nozzle or nozzles for directing the stream of air from which sterilant has
25 been removed into the atmosphere around the enclosure to create turbulence in the air.
6. An apparatus as claimed in any of the proceeding claims, wherein the
supplemental means to draw sterilant through the part of the enclosure downstream of the
catalyst during the room sterilization process comprises further fan means of relatively
30 low throughpull compared with the first mentioned fan means having a further inlet
disposed in said enclosure on said downstream side of the catalyst to draw air containing

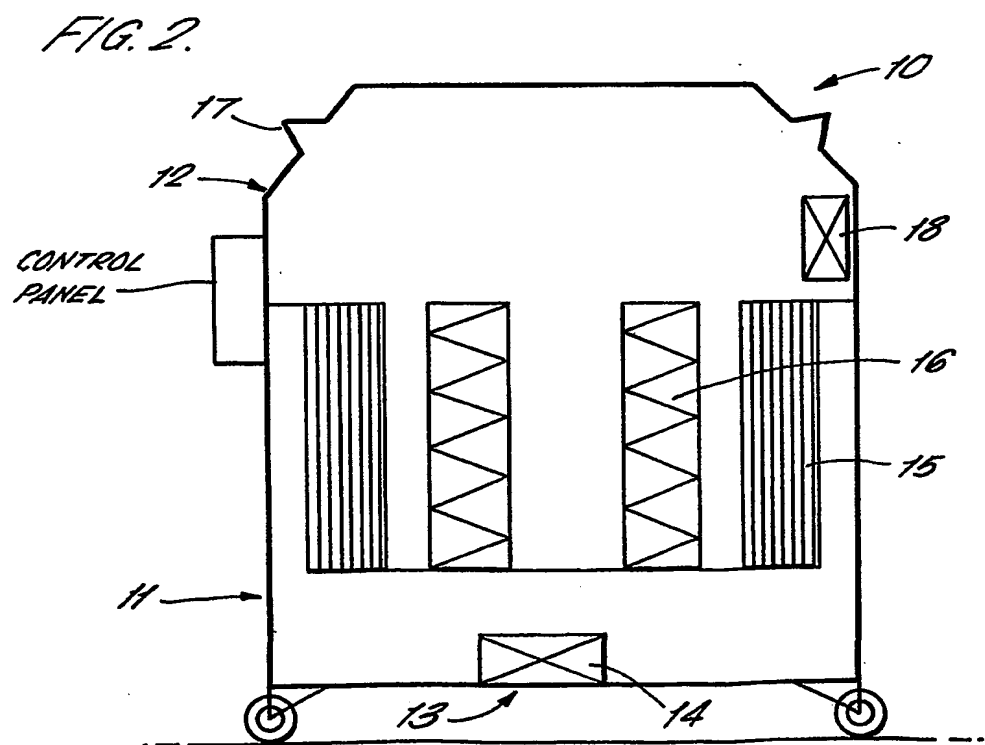
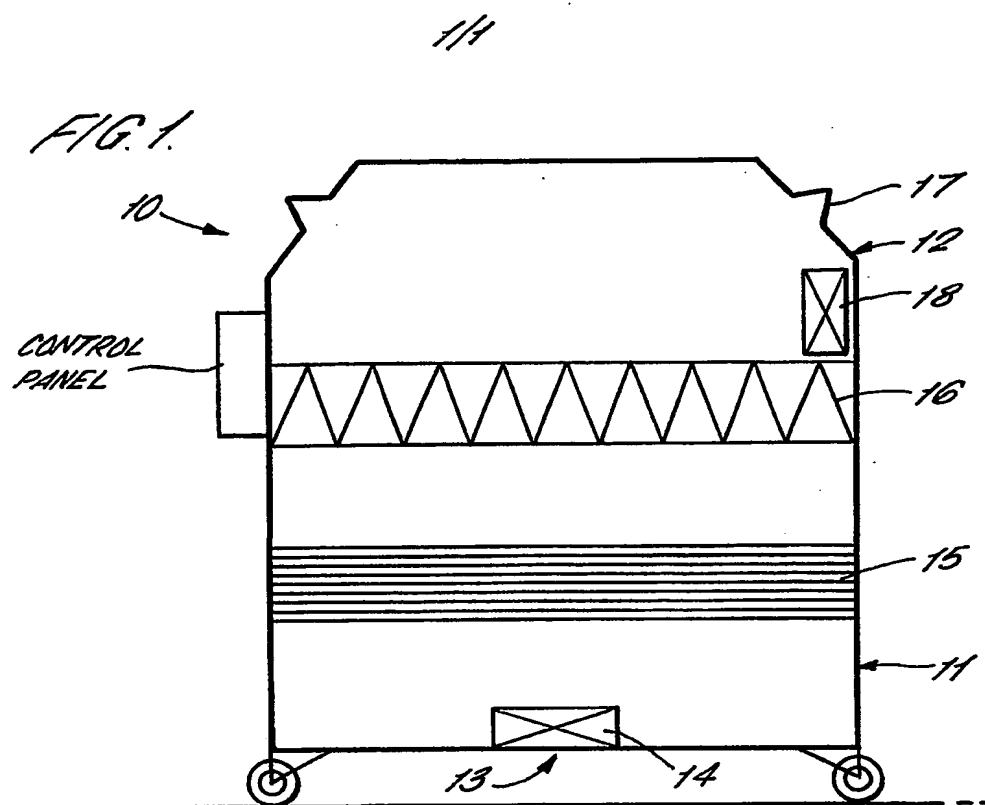
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sterilant from the atmosphere into the enclosure during the room sterilization process and to circulate air through the downstream side of the enclosure to sterilize that part of the enclosure, the air containing sterilant being released from the enclosure by said outlet from the enclosure.

5

7. An apparatus as claimed in any of the proceeding claims mounted on wheels to be readily mobile.

10



INTERNATIONAL SEARCH REPORT

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IPC 7 B01D53/86 A61L9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01D A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 13, 30 November 1999 (1999-11-30) & JP 11 221443 A (ETHICON INC), 17 August 1999 (1999-08-17) abstract	1
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Y	column 2, line 4 -column 3, line 3	4
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☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

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International Application No

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